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ABSTRACT

The study investigated the functional patterns of intellectual performance on the Wechsler Intelligence Scale for Children-Revised (WISC-R) of 55 children (ages 5-to-18 years) referred to a child center to determine if the WISC-R profiles could help identify the children as learning disabled. Secondarily the study utilized the factor-score approach in terms of clusters of subtests to ascertain if functional differences in learning styles exist. Results indicated that there were no differences between the study group when compared to normative data using the WISC-R standardization population as a reference. Of the three subtests examined (verbal-comprehension, analytic-field-approach, and attention-concentration) the attention-concentration factor was the lowest mean factor score for the study sample. It was concluded that attentional difficulties appear to play a central role in the learning problems of the sample studied. (PHR)

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WISC-R ANALYSIS: IMPLICATIONS FOR DIAGNOSIS AND EDUCATIONAL INTERVENTION OF LD CHILDREN

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Abstract

In this study the WISC-R performance of 55 children referred to the Child Service Demonstration Center was investigated. Examination of the WISC-R protocols for Verbal-Performance IQ differences and test scatter as measured by scaled-score range and 3± deviant scores on the three scales showed no differences for this study sample as compared to normative data using the WISC-R standardization population as a reference. A higher Performance IQ was not typical of this group of learning disabled children. Subtest patterning utilizing Witkin's three factor approach of Verbal-Comprehension, Analytic-Field-Approach, and Attention-Concentration showed a unique pattern. The Attention-Concentration factor was the lowest mean factor score for the total study sample significant at the .03 level. The Verbal-Comprehension and Analytic-Field-Approach factor subtests did not differentiate the children in this study sample. Hence, attentional difficulties as measured by the Attention-Concentration subtests appear to play a central role in the learning problems of these children. Findings of this study point up the value of a functional or process analysis of WISC-R performance in the assessment of the learning disabled child. Factor patterns may specify particular areas of strength and weakness and provide direction for individualized remedial instruction, thus demonstrating the usefulness of the WISC-R in psychoeductional evaluation.

WISC-R ANALYSIS: IMPLICATIONS FOR DIAGNOSIS AND EDUCATIONAL INTERVENTION OF LD CHILDREN

This study was designed to investigate the functional patterns of intellectual performance on the Wechsler Intelligence Scale for Children-Revised (WISC-R) of youngsters referred to the Child Service Demonstration Center at Northeastern Illinois University. The WISC-R protocols were examined for Verbal-Performance IQ differences, test scatter and differential subtest patterning relating this analysis to normative data developed by Kaufman (1976a,1976b). Such a comparison may indicate if this study sample has distinctive WISC-R profiles that may serve to identify the children as learning disabled.

A second purpose was to utilize a factor-score approach in terms of clusters of subtests hypothesized to reflect functional differences in learning styles (Witkin, Dyk, Faterson, Goodenough & Karp, 1962). Witkin et al (1962) propose that WISC subtests fall into three major factors that tap relatively independent functions. These factors are: Verbal-Comprehension (VC) composed of Information, Vocabulary, and Comprehension subtests; Analytic-Field-Approach (AFA) made up of Object Assembly, Block Design, and Picture Completion subtests; and Attention-Concentration (AC) composed of Arithmetic, Digit Span and Coding subtests.

Recent studies found significant differences in performance on these three factors by clinically defined samples of hyperactive and

learning disability children and by pupils in public schools classified as educationally handicapped and educable mentally retarded (Keogh & Hall, 1973; Keogh, Wetter, McGinty & Donlon, 1973). This study expands the application of a process analysis of WISC-R data to a study sample of learning disabled children of a high socio-economic-cultural level attending regular classrooms and showing learning problems of a sufficient degree to be referred for evaluation. The analysis of data in the patterning of these three factors for this study sample may serve to determine if this group of children operate within the framework of some definable functional style such as that proposed by Witkin et al. (1962). The usefulness of the WISC-R in psychoeducational evaluation may be enhanced by identifying strengths and weaknesses, thus providing direction for individualized program planning.

The Child Service Demonstration Center (presently known as the William Itkin Children's Service Center) was originally funded under a Title VI-G grant from HEW (Stevenson & Lerner, 1978). The Center offers clinical and educational services to learning disabled children who reside in the suburban-urban area surrounding the University and training to special education graduate students in the learning disability sequence.

Seventy children tentatively identified as learning disabled were referred to the Center between October 1976 and September 1977 by parents, public and private school personnel and other communi-

ty agencies. Criteria for acceptance into the program included average intellectual ability and a significant discrepancy between potential and academic achievement. A cut-off point of 80 rather than 90 for the Full Scale IQ was used, with an IQ of 90 on either the verbal or performance measure as the determining score (Johnson & Myklebust, 1967). Fifteen of the 70 children referred did not meet these criteria. Hence, a total of 55 children provided data on all cognitive measures. These 55 children will be referred to as the study sample.

Reasons given for referral included hyperactivity, distractibility, and poor attention, as defined by parent and teacher subjective data. Academic problems were defined as skill deficits that were great enough to interfere significantly with educational progress. The children were all enrolled in regular classrooms in parochial or urban-suburban public schools. They ranged in age from 5 yrs. 10 mos., to 17 yrs. 3 mos. FSIQs ranged from a low of 78 to a high of 116 with a full scale mean of 96.89, verbal mean of 97.41 and performance mean of 97.38. Comparing the distribution of IQ scores with an expected distribution based on Wechsler's standardization population led to a χ^2 of 10.3, $p=.09$. Therefore, it can be said that this sample is rather typical in its distribution.

The socio-economic level of this population was markedly middle to upper class and predominately white. Thirty-three per cent of the fathers' occupations ranked in the professional and

technical workers category of Wechsler's classification of occupations as compared to 15% of the standardization population. These data support the statement that the sample in this study was drawn from an atypical population.

An in-depth psychoeducational evaluation was administered to each child. The staff psychologist gave the WISC-R and the Bender Motor Gestalt Test. Graduate students completed the educational evaluation. The behavioral symptoms of each child's academic deficiencies were explored to delineate probable learning process correlates. Analysis of subtest patterning on the WISC-R protocols was an essential aspect of the graduate students' clinical experience (Bannatyne, 1968, 1978; Glasser & Zimmerman, 1972; Ogdon, 1978; Sattler, 1974; Searls, 1975). On the basis of the evaluation, an educational plan was formulated; the Center's remedial services then provided individualized instruction.

Analysis of WISC-R Data

Verbal-Performance IQ Discrepancies

Clinicians have regarded discordance between the WISC-R Verbal and Performance IQs as one characteristic in the identification of the learning disabled child (Adams, 1968; Clements & Peters, 1962). Discrepancy scores on this study sample were categorized as follows: (a) Verbal and Performance IQs not significantly different; (b) Verbal IQ significantly greater than Performance IQ; (c) Performance IQ significantly greater than Verbal IQ. The WISC-R manual presents three different signifi-

cance levels for evaluating discrepancies between Verbal and Performance IQs (Wechsler, 1974, pp. 34-35). A 9-point discrepancy is significant at the .15 level; 12 points at the .05 level; and a discrepancy of 15 points is significant at the .01 level. Evaluating data on the WISC-R profiles in this study sample in terms of their deviation from Wechsler's standardization population as a reference group, is presented in Table 1.

The cumulative distribution for the study sample indicates that over half of the children had discrepancies of 9 or more points, about one-third had discrepancies of 12 or more , and about one fourth had discrepancies of 15 or more points. Using Table 1 as a basis for comparing population estimate with the study data, χ^2=1.50 was calculated. This indicated no significant difference between the population of the study sample and what would be expected in the normal population.

The mean discrepancy difference regardless of direction was 10.1 for the study sample. It was 9.7 (SD=7.6) for the standardization population (Kaufman, 1976a, p. 742). Thus, the average child had a Verbal-Performance IQ difference of 9 or more points, ($p < .15$). As many as 1 out of 4 normal children showed a discrepancy score of 15+ points which Wechsler (1974,p.34) considers important and worthy of further investigation. One out of 4 of the learning disabled children in the sample study showed a similar Verbal-Performance IQ difference.

Table 1

Number and Percentage of Children with Significant Differences Between Verbal and Performance IQs: Study Sample Compared to Standardization Population

Group	1+ points			9+ points*			12+ points**			15+ points ***		
	V>P	P>V	Total	V>P	P>V	Total	V>P	P>V	Total	V>P	P>V	Total
Study Sample												
Number	22	33		16	15		11	8		8	5	
Percent	40	60	100	29	27	56	20	14	34	15	9	24
Standardization Population												
Number	2200			506	560		352	396		264	286	
Percent			100	23	25	48	16	18	34	12	13	25

Note. Percentage for standardization population from Kaufman, 1976a, Table 1, p. 741.

* $p < .15$
** $p < .05$
*** $p < .01$

Table 1 indicates that the percentages of significant Verbal-Performance differences were divided about equally between Verbal > Performance and Performance > Verbal at each level of significance for the standardization population. This did not hold true for the study sample; there was a larger number and percentage of children with Verbal IQs greater than Performance IQs at the .05 and .01 levels of significance with a 12+ and 15+ difference. The mean discrepancy score for the Verbal scale was 12.1; the mean discrepancy score for the Performance scale was 8.8. This indicates that the children in the study sample were superior in their verbal abilities as compared to nonverbal abilities, a fact which probably reflects the verbosity of the higher SES culture.

On the other hand, there was a large number and percentage of children with a P > V with a 0-8 point discrepancy, which is not a significant difference. Regardless of the level of significance of that discrepancy, a count of P > V versus V > P IQs indicates that 33 children in this study sample had a Performance IQ greater than their Verbal IQ, while 22 children had a Verbal IQ higher than their Performance IQ. This is an interesting finding in view of statements in the research literature that learning and reading disabled children have higher Performance IQs. This assumption of a higher Performance IQ as a clinical sign is true if one disregards the statistical significance of the IQ difference. A review of the literature (Huelsman 1970) showed that few if any of these investigations took into consideration the statistical significances of

of Verbal and Performance IQs in presenting data regarding their study samples.

Analysis of Test Scatter

WISC-R profiles of children in the present study sample were also analyzed to determine if a high degree of scatter characterized this learning disabled sample. Two indices of test scatter were used: (1) the size of the difference between the highest and lowest scaled-scores (H-L) earned by the child and (2) the number of tests deviating by 3 or more points from the child's own mean scaled score on each of the three scales - Verbal, Performance, and Full Scale. Table 2 presents means and standard deviations for their H-L scaled-score ranges compared to normative data developed by Kaufman (1976b) that used Wechsler's standardization population as a reference group.

Table 2

Comparison of Means and SDs of Scaled-Score Range: Study Sample and Standardization Population

WISC-R	Study Sample (n=55)		Standardization Population (n=2200)	
Scale	Mean	SD	Mean	SD
Full Scale	7.2	2.1	7.0	2.1
Verbal	5.7	1.9	5.3	2.0
Performance	5.4	2.3	5.5	2.3

Note. Data for standardization population from Kaufman, 1976b, Table II, p. 163.

In his investigation of the WISC-R profiles of the standardization population, Kaufman expressed surprise at the magnitude of the scaled-score range. His analysis contradicts the "flat profile stereotype" usually attributed to the average child. The results showed that the average scaled-score range for the Full Scale was a mean of 7 (SD=2.1). This mean of 7 ± 2 was found to characterize each of the 11 age groups as well as children from different socio-economic backgrounds. Thus, the average child had a scaled-score range of about 6-13 or 7-14. Considering as normal, values within one standard deviation of the mean, a scaled-score range of 9 is a normal amount of scatter. Hence, ranges such as 3-12 or 6-15 on the 10 subtests may be considered normal and expected.

The WISC-R profiles of children in this study sample showed a range of 2-11 on the Verbal scale, 2-12 on the Performance, and 3-12 on the Full scale. Computing mean scores and standard deviations, a significant difference on this index of scatter was not found when the study sample was compared to the standardization population. In general, the scaled-score ranges for the learning disabled children in the study sample did not differ significantly from the normative values.

Scatter on the WISC-R profiles of the study sample was also evaluated by computing the mean and standard deviations of the number of subtest scores which deviated by 3 or more points from the child's own mean for each of the scales. Kaufman (1976b) has computed similar data for the standardization population.

Table 3 compares the study sample with the normative population on this index of test scatter.

Table 3

Means and SDs of 3^{+}_{-} Deviant Scores: Study Sample Compared to Standardization Population

WISC-R Scales	Study Sample (n=55)			St. Population (n=2200)	
Full Scale (10 tests)	1.6	1.1	ns	1.7	1.3
Verbal (6 tests)	0.9	1.0		0.8	0.9
Performance (5 tests)	0.7	0.9		0.8	0.9

Note. Data for standardization population from Kaufman (1976b), Table IV, p. 165.

The average child in the standardization population had about one test score deviating significantly from his/her own Verbal or Performance mean and about two tests deviating significantly from his/her Full Scale mean. Means and standard deviations for the study sample closely approximated these means. Hence, utilizing the criterion of 3^{+}_{-} deviant subtest scores from the child's mean subtest score, the profiles of this study sample did not exhibit any greater intratest variability than did the profiles of the WISC-R standardization population. In summary, this sample

of exceptional children compared favorably with the normative population in terms of Verbal-Performance IQ discrepancies, scaled-score range differences and intra-test scatter.

Analyzing Subtest Patterns

Although no statistical difference between the means of the Verbal and Performance IQs was found for this study sample, the WISC-R profiles for these learning disabled children did show meaningful differences between the various subtest scores utilizing Wechsler's criteria. Hence, the summarizing of IQ values may mask functional differences that can provide important diagnostic and evaluative data. It is therefore important to go beyond the Verbal-Performance distinction and to analyze performance on the subtests of the WISC-R profiles of children within this sample.

Statistical analysis of the WISC-R subtests for this study sample shows the following means and standard deviations for the eleven subtests. Table 4 presents these data.

Table 4

Means and SDs of IQ Subtests: Study Sample (N=55)

Variable	Mean	SD
Information	9.2182	2.4 *
Similarities	9.8182	2.6
Arithmetic	8.9091	2.8 *
Vocabulary	10.0000	2.5
Comprehension	10.6909	2.4
Digit Span	7.5091	2.8 **
Picture Completion	10.1818	2.1
Picture Arrangement	9.8727	2.6
Block Design	9.8727	2.2
Object Assembly	9.7091	2.6
Coding	8.2909	2.7 *

* $p < .05$
** $p < .01$

Examining the distribution pattern of the subtest means, Digit Span was found to be significantly lower than the other subtests for this sample ($p < .01$). Arithmetic, Coding and Information were significantly lower at a .05 level. Reading disabled children and various groups of learning disabled children have scored characteristically low on these four subtests (Huelsman, 1970;

Smith, Coleman, Dokecki & Davis, 1977). Thus, findings of the statistical analysis of the WISC-R subtests of this study sample appear to be highly consistent with the trends noted in other research studies.

Utilizing the factor score approach as proposed by Witkin et al. (1962), WISC data on the profiles of these children were organized to determine if a unique profile characterized this study sample. The study sample as described earlier in this paper was of a socio-economic cultural level above that of the average population. It was also proposed that such a factor score approach would offer diagnostic information of importance in understanding the learning problems of the specific individual being assessed.

Witkin has proposed that WISC subtests fall into three major factors that tap relatively independent functions. These factors are: Verbal-Comprehension (VC), composed of Information, Vocabulary, and Comprehension subtests; Analytic-Field-Approach (AFA) made up of Object Assembly, Block Design, Picture Completion subtests; and Attention-Concentration (AC) composed of Arithmetic, Digit Span and Coding subtests.

It should be noted, however, that Witkin's three factor analysis was based on the 1949 WISC. Kaufman (1975) factor-analyzed the sample data for the standardization of the WISC-R and concluded that the factor structure of the instrument

remained essentially unchanged. He found three significant factors and although they were assigned different labels, they correspond closely to Witkin"s major factors in terms of specific subtest loadings. Kaufman specifically cited the potential utility of his Freedom from Distractibility factor (identical in composition to Attention-Concentration factor) in interpreting WISC-R profiles of reading disabled and severely and moderately learning disabled children. Hence, it appears that the potential psychoeducational and diagnostic utility of Witkin's three major factors is at least as great with the WISC-R as with the WISC.

Table 5 shows the analysis of variance as relating to the VC, AFA and AC factors. Table 6 presents the means associated with this analysis of factors.

Table 5

Analysis of Variance on VC, AFA, and AC factors: Study Sample

	d.f.	Mean Square	F	p
Between factors	2	15.33	3.57	.03
Between subjects	54	4.29		

Table 6

Means and SDs of VC, AFA and AC Factors: Study Sample

Factor	Mean	SD	p
VC	29.90	6.1	ns
AFA	29.96	5.0	ns
AC	24.87	5.3	.03

As noted in Table 5 there was a significant factor effect. The AC factor as indicated in Table 6 was found to be the lowest factor mean. The difference between AC and AFA, and AC and VC was significant at the .03 level. There was no significant difference between the VC and AFA factors for the children in this study sample.

In addition to investigating factor patterns by total group. sex differences were also examined. Table 7 presents this data:

Table 7

Means and Standard Deviations of VC,

AFA, & AC Factor Scores for Boys and Girls

Factor	Number	Mean	SD	p
VC				
Boys	46	29.78	6.1	ns
Girls	9	30.55	6.2	
AFA				
Boys	46	30.26	5.3	ns
Girls	9	28.44	2.5	
AC				
Boys	46	24.63	5.4	ns
Girls	9	26.11	4.9	

Again, the AC factor was the lowest for the boys and girls as compared to the AFA and VC factors. The differences, however,

were not statistically significant.

The boys showed a slight but not significant superiority over the girls on the AFA factor, a factor which reflects analytical ability. Although no significant differences were found between boys and girls on the AFA factor, the actual sample differences were in the direction predicted by Witkin. Research by Witkin in terms of his field dependence-independence construct have found consistent sex differences with boys more field-independent than girls. Hence, the higher scores on the AFA factor by boys in the present study are in agreement with previously reported findings.

Data were also analyzed to determine the possibility of grade-age differences as they may be reflected in performance on these three factors. Table 8 presents this data:

Table 8

Means and SDs of VC, AFA and AC Factor Scores for Three Grade-Age Groups

Factor	Number	Mean	SD	p
VC				
1. Kdg-3rd	15	30.46	7.2	ns
2. 4th-8th grd	26	31.34	5.8	
3. H.S. Level	15	26.64	4.0	
AFA				
1. Kdg-3rd grd	15	28.93	5.8	ns
2. 4th-8th grd	26	29.65	4.9	
3. H.S. Level	14	30.85	4.6	
AC				
1. Kdg-3rd	15	27.66	3.9	.05
2. 4th-8th grd	26	24.11	5.5	
3. H.S. Level	14	23.28	5.4	

An analysis of variance showed no statistically significant difference between the groups' scores on the VC or AFA factors. A significant difference between the age-grade groups on the AC factor, significant at the .05 level was found. The difference was due to a significant linear effect with scores decreasing with age-grade classifications. The effect may reflect the increasing demands made for attention as children progress through the grades. In the middle grades children are expected to work more independently on work-study assignments. The lecture type of class presentation at the high school level also demands greater attention-concentration. The lower factor score may also reflect greater test anxiety and the persistence of failure as children with learning problems progress through the grades.

Data were also analyzed to determine the possibility of differences in performance on these factors in terms of levels of intellectual ability. The study sample was therefore divided into three subgroups as follows: Group A - Dull Normal and Borderline with IQs of 78 to 89; Group B - Average with IQs of 90 to 109; and Group C - High Average with IQs of 110 and above.

An analysis of variance based on differences in the factor scores among the three IQ groups showed no significant differences for Group A. For Group B, the AC factor was lower than VC and AFA and significant at the .01 level. For Group C, the AC factor was lower than VC and AFA and significant at the .05 level.

Table 9 shows the analysis of variance as relating to the VC, AFA and AC factors and the mean scores for these factors based on levels of intelligence.

Table 9

Means & SDs of VC, AFA and AC Factor Scores for Levels of Intelligence

Factor	Group A (N=13) 70-89		Group B (N=35) 90-109		Group C (N=7) 110+	
	Mean	SD	Mean	SD	Mean	SD
VC	22.69	3.9	31.02	4.2	37.71	3.4
AFA	26.23	3.2	29.85	4.2	37.42	3.4
AC	21.69	6.2	25.40	4.7	27.85	4.4
p	ns		.01		.05	

Studies by Keogh (1973) and findings reported by Witkin et al. (1962) show that groups of children classified as Educable Mentally Retarded score higher on the AFA factor than on the VC factor. Although this study sample may not be classified as Educable Mentally Retarded, the findings of this study may indicate that children in the Dull Normal range also tend to perform better on the AFA factor tasks than on tasks measuring the VC factor.

In summary, analysis of factor scores indicated no significant differences between the VC and AFA factors for the children in this study sample as a total group or in terms of subgroups

based on grade-age and IQ differences. However, the AC factor was the lowest mean factor score for the total study sample. The difference between the AC factor and AFA and between AC factor and VC was significant at the .03 level. When age-grade groups were studied, it was found that the AC factor scores decreased significantly with age and grade ($p < .05$). When the study sample was divided into three IQ groups, the AC factor was significantly lower for children with IQs between 90-109 at the .01 level and for children with IQs above 110 at the .05 level of significance.

IMPLICATIONS FOR INTERPRETATION

This study stemmed from an interest in determining the predictive and diagnostic value of the WISC-R in understanding the learning problems of children. Verbal-Performance IQ discrepancies as well as subtest patterning on the WISC-R protocols of 55 children were examined. This analysis was based on a statistical approach to determine significant differences. Data obtained on several measures of scatter were compared to normative data developed by Kaufman (1976a, 1976b) using the standardization population as a reference. This analysis and comparison revealed that the study sample as a group did not differ significantly from the standardization population.

The fact that this study sample did not differ greatly

from the standardization population does not minimize the importance of looking at statistically significant scores on the WISC-R profiles of individuals within the sample group. Kaufman (1976a, 1976b) has provided tables against which an unusual Verbal-Performance discrepancy, a wide scaled-score range, or a high degree of deviant subtest scores on a child's WISC-R profile may be entered to determine how prevalent these fluctuations occur in the normal population. For example, a child's WISC-R profile shows a Verbal-Performance discrepancy of 26 points. This discrepancy is significant at the .01 level and occurs in less than 5% of the normative population. It may be considered not only statistically significant but it is also abnormal and may be related to a suspected diagnosis of a learning disability. On the other hand, a 12 point discrepancy in favor of the Verbal scale is significant at the .05 level but it is not an abnormal discrepancy since 30% of the children with average intelligence have discrepancies as large or larger. It does suggest that the child functions better verbally than non-verbally. This fact has educational significance in planning remedial intervention.

The tables provided by Kaufman on normal Verbal-Performance discrepancies and subtest scatter should be utilized by clinicians as sources of basal levels. Statistical significance is important, but it is also essential to know how prevalent the IQ discrepancy, scaled-score range, and/or degree of subtest scatter occurs in the normal population. In this way the clinician can determine

objectively the diagnostic significance of a discrepant score on a WISC-R profile as well as to evaluate its educational significance.

In analyzing the pattern of subtest scores for this sample study, it was found that Attention-Concentration was the lowest factor score, significant at the .03 level for the total study sample. Kaufman (1975) in his factor analysis of the WISC-R has labeled this factor, Freedom from Distractibility. He found it to emerge in a number of studies of normal and exceptional populations. Computing deviations IQs on the VC, AFA, and AC factors for the children in this study sample, the AFA deviation IQ was highest for 28 children; the VC deviation IQ was highest for 22 children; and the AC deviation IQ was highest for only 5 children when the three IQs were compared. The deviation IQ for the AC factor score ranked lowest for 36 children. The VC deviation IQ was lowest for 10 children; the AFA deviation IQ was lowest for 9 children.

Hence, the results of this analysis of WISC-R performance suggest attentional difficulties as a key factor in the learning problems of many children in this study sample. A study by Keogh and Hall (1973) found educationally handicapped children scoring lowest on the Attention-Concentration factor with adequate scores on Verbal-Comprehension and Analytic-Field-Approach. A study of clinically defined learning disordered and hyperactive learning-disordered children gave similar results (Keogh et al. 1973).

A study utilizing Bannatyne's categories of WISC subtests found 62% of a group of school-verified learning disbled children scoring lowest on the sequential category, which is comprised of the same three subtests as the Attention-Concentration factor (Smith et al. 1977). Bannatyne (1978) implies a specific process disability reflecting auditory-vocal deficits especially in memory. In contrast to Bannatyne, Keogh and Hall (1973) point out that failure to pick up attentional cues and not an inability to process information may be the critical variable in the learning problems of children.

Other research studies pinpoint Digit Span, Arithmetic and the Coding subtests as most vulnerable to test anxiety and contend that this accounts for a child's poor performance rather than inability to attend. Arithmetic, Digit Span and Coding B are the WISC-R subtests that primarily are measures of symbolic content; hence, difficulty of disabled readers to deal with symbolic skills may also be a plausible explanation. Hence, the examiner must use clinical expertise in interpreting the meaning of this score. Information about the child's background, methods of solving problems, and clinical observations of the child's behavior are essential before reaching an explanation for a child's performance on the tests comprising the Attention-Concentration factor.

Varying kinds of attending behavior are involved in the

subtests which comprise the Attention-Concentration factor. The Digit Span and Arithmetic subtests, according to Glasser and Zimmerman (1967) measure ability to attend, involving such aspects of attention as mental alertness, ability to suspend irrelevant thought processes while attending, and focus of attention. The Coding subtest, which may reflect eye-hand coordination, requires memory and good attentional abilities for efficient performance. Keogh and Margolis (1975) suggest a more precise differentiation of attentional difficulties as "coming to attention, decision making and sustained attention" each of which calls for remedial strategies appropriate to the particular disturbance of attention.

Attentional processes in learning disabled youngsters have been the focus of a number of research studies (Ross, 1976; Tarver & Hallahan, 1974). The implications of these studies are that learning disabled children are characterized by a developmental lag in verbal rehearsal strategies and a delayed development in the capacity for selective attention (Hagen & Hale, 1973; Hallahan, Tarver, Kauffman, & Graybeal, 1977; Tarver, Hallahan,Kauffman & Ball, 1976; Senf & Freudl, 1969; Torgeson, 1977).

In conclusion, findings of this study indicate that the WISC-R, utilizing a functional or process analysis of its subtests may be of real value in differential diagnosis. Factor patterns may specify particular areas of strength and weakness and provide direction for individualized remedial instruction. That attentional processes play

a central role in the learning problems of a large majority of children in this study, underscores the importance of seeking ways to develop more active problem-solving strategies. Direct teacher instruction, strategy-modeling, self-verbalization and cognitive behavior modification are techniques well-suited to the learning disabled child. Instructional intervention must not only provide remediation in the use of efficient task strategies, but must also be directed to help the child gain a greater understanding of him/herself as an important and active agent in his/her own learning and achievment in school.

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